

Length, 3; height, 1.8; diameter 1.6 (inches).

Length 76, height 51, diameter 40 mm.

Found by Mr. W. H. Over, at Ulvers Point, Clear Lake, Deuel Co., South Dakota, July 1, 1909.

To launch a new *Anodonta* is a perilous undertaking, but in this instance the novelty of the form is unmistakable. The beaks ally the shell, of course, to *Anodonta grandis*, Say. It is nearest to that form called by Mr. Anthony *A. subgibbosa* (and especially to the figure of this species shown in the *Conchologia Iconica*, which is much more characteristic than the figure in the *American Journal of Conchology*). From any form of *Ano. grandis* it differs in being more cylindrical, *i. e.*, in lacking the swelling "amidship" so often shown by *A. grandis*; in being rayless (so far as known), but especially by having its posterior point not elevated above the basal line, and by the marked truncation posteriorly, which truncation is as marked as in *Morgaritana morginata* Say, and the straight posterior, and the resulting quadrilateral aspect of the shell. It is more quadrate than *Anodonta doliaris*, Lea. The lack of any *obliquity* is remarkable. Mr. Over also sent me from the same lake examples of *Anodonta grandis*, Say, and the facies of our species was strikingly dissimilar.

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#### A NEW SYSTEM OF THE UNIONIDÆ.

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Since October, '09 the present writer has been engaged in the study of the anatomy of the soft parts of the *Unionidæ* of Pennsylvania, collected during the last four years. The material at hand being very rich, it was possible to make out the structure of most of our species, and the results obtained are rather satisfactory, and are apt to furnish new principles for the systematic arrangement of the species.

Simpson (Pr. U. S. Nat. Mus. 22, '00). in his system, has indicated some of the essential principles of classification, in fact, the first pointed out *the* most important feature, the shape of the *marsupium*, Yet this system must be changed considerably, if it is to represent the natural affinities. This is due chiefly to the fact, that Simpson, on the one hand, had rather insufficient material, and on the other, that he did not go into microscopic detail.

Some corrections of Simpson's system have been advocated by Sterki (*Amer. Naturalist* 37, '03 p. 103 ff.), and, generally, I find that these are well supported. Yet there are other differentiations in structure, which have been overlooked hitherto, and which are of prime systematic value.

The most important (and gratifying) result of my investigations is, *that the gills or parts of gills, which serve as marsupium during the breeding season, are permanently differentiated in their anatomical structure from those gills (or parts of gills), which never serve as marsupium.* Thus it is possible to recognize the type of marsupium of any species, if only sterile females are at hand.

My investigation will be published in full in the "Memoirs of the Carnegie Museum," amply illustrated by figures of the structures discussed. Although I am not quite done yet, and although I hope to secure additional material next summer, I think it advisable to publish my preliminary results as soon as possible, in order to direct the attention of the collectors to those genera, which I have not been able to investigate. It would be desirable for anybody, who intends to collect *Unionidæ* next summer, to make up his mind from the beginning, that shells without the soft parts are not the thing that is wanted, but that the soft parts, at least of some specimens, should always be preserved in alcohol.

The family *Unionidæ*, in Simpson's sense (l. c., p. 514, 515, 516), is accepted. Simpson divides it into two subfamilies, of which one, *Hyriinæ* (= *Hyrianaæ* Swains., Simpson, pp. 515 and 806), is extralimital, and which cannot be discussed at present. The other is the *Unioninæ* Swains. All our North American forms belong to the latter. But I think they should be divided into four groups, which I would designate as subfamilies. Thus, disregarding the *Hyriinæ*, the *Unionidæ* are divided into four subfamilies, as shown below.

In the following I shall give a systematic arrangement of the Pennsylvanian species. Of the characters, I have given the most important ones of the soft parts for the subfamilies, and for the genera where necessary. It is not my intention to go into any detail, since further investigations may possibly necessitate minor changes in the arrangement of the genera. Some notes are appended at the end, in order to explain the most striking changes introduced here.

## 1. Subfamily: MARGARITANINÆ.

Gills *without well-defined water tubes*; connections of the two laminae by irregularly scattered prominences, but not by septa. (This is a most remarkable character, in which *Margaritana* differs from all other genera.) Supra-anal opening not separated from the anal opening. Diaphragm (posterior part of gills, separating anal and branchial openings) of peculiar shape: *the outer lamina of the outer gill is free from the mantle for a considerable distance*. Inner lamina of inner gills free from the abdominal sac. No papillæ on edge of mantle in front of branchial opening. (Marsupium and glochidia unknown to the writer.)

Genus and species: *Margaritana margaritifera* (L.).

## 2. Subfamily: UNIONINÆ.

Gills with rather *well-defined water tubes*, the latter formed by septa, which run the whole width of the gill, parallel to the gill-filaments. Supra-anal opening not separated or (generally) separated from the anal, the closed part rather short. Diaphragm normal (*i. e.*, outer lamina of outer gills connected with the mantle to their posterior end). Inner lamina of inner gills always free from abdominal sac. No papillæ on mantle edge in front of branchial opening. *Marsupium formed by both gills or only by the outer gill; edge of marsupium always sharp* (not distending). Water tubes not divided in the gravid female. *Glochidia* semioval or semicircular, without spine.

1. Genus: *Quadrula* (Raf.) Ag. (restr.). Both gills (inner and outer) serving as marsupium.

Species: *subrotunda* (Lea) [and var. *kirtlandiana* (Lea)]—*rubiginosa* (Lea) [and var. *trigona* (Lea)]—*pustulosa* (Lea)—*metanевра* (Raf.)—*cylindrica* (Say)—*tritogonia* (Ortm)<sup>1</sup>—*undulata* (Barn.).

2. Genus: *Rotundaria* Raf. (as subgenus). Outer gills only serving as marsupium. Supra-anal opening not separated from the anal. Also with peculiar shell characters.

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<sup>1</sup> *Quadrula tritogonia* Ortm. = *Tritogonia tuberculata* (Barn.) of Simpson. The nomenclature of this species remains to be settled. Since *Qu. tuberculata* (Raf.) is now removed from the genus *Quadrula*, the specific name *tuberculata* might become available. *Qu. lachrymosa* (Lea) probably is also a true *Quadrula*.

Species: *tuberculata* Raf.

3. Genus: *Pleurobema* (Raf.) Ag. (enlarged). Outer gills serving as marsupium. Supra-anal separated from the anal.

Species: *cooperiana* (Lea)<sup>1</sup>—*æosopus* (Green).

*obliqua* (Lam.) [including the form *pyramidata* (Lea) and the var. *coccinea* (Conr.)<sup>2</sup>  
*clava* (Lam.).

4. Genus: *Unio* Retz.<sup>3</sup>

Species: *crassidens* (Lam.)—*gibbosus* (Barn.)—*complanatus* (Dillw.)—*productus* (Conr.) (Fulton Co., Pa.).

### 3. Subfamily: ANODONTINÆ.

Water-tubes similar to those of the *Unioninæ*, only less regular at base of gills, chiefly so in the male. Supra-anal opening well separated from the anal; sometimes the connection of the mantle margins is very long. Diaphragm normal. Inner lamina of inner gills generally free from the abdominal sac, sometimes with the tendency to become connected with it, or entirely connected. No papillæ on mantle edge in front of branchial opening. *Marsupium formed by the outer gills; edge of marsupium, when charged, distending, the thickened tissue forming the edge stretching out in a direction transversal to the gills, but not bulging out beyond the edge of the gill (or only slightly so).* Water-tubes in the gravid female *divided longitudinally into three tubes*, one lying toward each face of the gill, the third in the middle; only the latter contains eggs or embryos, and is much larger than the outer tubes. This division into three parts is not present in the sterile female. *Glochidia* subtriangular, with one spine at the tip.

1. Genus: *Alasmidonta* Say.<sup>4</sup>

<sup>1</sup> *Pleurobema cooperiana* (Lea) (= *Qu. cooperiana* of Simpson) surely groups with *Pl. æosopus*.

<sup>2</sup> *Pl. obliqua*, *pyramidata* [and also *plena* (Lea)] form a natural group by themselves, and probably are one and the same species. *P. pyramidata* is only an extreme variation of *P. obliqua*, with which it occurs, while *coccinea* is a good ecological variety, which, however, runs into *obliqua* at certain localities.

<sup>3</sup> The characters of the soft parts of *Unio* are practically identical with those of *Pleurobema*. A distinction is possible only by shell characters.

<sup>4</sup> The genera of the *Anodontinæ* are distinguished chiefly by shell characters, but it seems as if *Alasmidonta* and *Strophitus* are more closely allied to each other, and then again *Symphynota*, *Anodontoides* and *Anodonta*.

Species: *heterodon* (Lea)—*marginata* (Say) [and var. *varicosa* (Lam.)]—*undulata* (Say).<sup>1</sup>

2. Genus: *Strophitus* Raf.<sup>2</sup>

Species: *undulatus* (Say) [= *edentulus* (Say)].

3. Genus: *Symphynota* Lea.

Species: *compressa* (Lea)—*viridis* (Conr.).<sup>3</sup>  
*costata* (Raf.)—*complanata* (Barn.).

4. Genus: *Anodontoides* Simps.

Species: *ferussacianus* (Lea) (and var. *subcylindraceus* (Lea)).

5. Genus: *Anodonta* Brug.

Species: *cataracta* Say.—*grandis* Say (with several varieties)  
*imbecillis* (Say).<sup>4</sup>

#### 4. Subfamily: LAMPSILINÆ.

Water tubes similar to those of the *Unioninæ*. Supra-anal opening separated from the anal, rarely entirely closed. Diaphragm normal. Inner lamina of inner gills rarely more or less free from abdominal sac, generally entirely connected with it. Mantle edge in front of branchial opening crenulated, *papillose*, or *with a peculiar flap*. *Marsupium formed by the outer gill, or (mostly) by the posterior part of the outer gill* (sometimes only a section of the latter is used for the marsupium). *Edge of marsupium, when charged, rounded, distended and bulging out beyond the ends of the branchial filaments*. Water tubes in the gravid female simple. *Glochidia* generally of the type of the *Unioninæ*, rarely different, and rectangular with two spines.

1. Genus: *Ptychobranthus* Simps.<sup>5</sup>

Species: *phaseolus* (Hildr.)

<sup>1</sup> *Alasmid*. *heterodon* stands by itself, while *marginata* and *undulata* are more closely related.

<sup>2</sup> The marsupium of *Strophitus* is very peculiar and complex, and cannot be explained in a few words and without figures. The discharge of the "placenta" ("ovisacs" of Simpson) is *not* through the walls of the gills, as Simpson indicates (l. c. p. 616).

<sup>3</sup> *Symphynota compressa* and *viridis* are *hermaphrodites*!

<sup>4</sup> As already Sterki has shown, *Anodonta imbecillis* is a *hermaphrodite*, which I am able to confirm. I know another species of *Anodonta*, from Texas, which is also hermaphroditic; it groups with *imbecillis*, and belongs possibly under *A. henryana* Lea (or may be a new species).

<sup>5</sup> The peculiar character of the marsupium of *Ptychobranthus* is well known; this form reveals what is essential in the *Lampsilis*-type of marsupium. The genus *Cyprogenia* Ag., which I had no chance to investigate, very likely should follow after *Ptychobranthus*.

2. Genera : *Obliquaria* (Raf.) Simps.—*Plagiola* (Raf.) Ag.—*Obovaria* (Raf.)<sup>1</sup>  
 Species : *Obliquaria reflexa* Raf.  
*Plagiola securis* (Lea)—*elegans* (Lea).  
*Obovaria retusa* (Lam.)—*circulus* (Lea)—*ellipsis* (Lea).  
*Obovaria ligamentina* (Lam.)<sup>2</sup>
3. Genus : *Proptera* Raf.<sup>3</sup>  
 Species : *gracilis* (Barn.)—*alata* (Say).
4. Genus : *Carunculina* Simps. (subgen.)  
 Species : *parva* (Barn.)<sup>4</sup>
5. Genus : *Micromya* (Ag.) Simps.  
 Species : *fabalis* (Lea.)<sup>5</sup>
6. Genus . *Lampsilis* Raf. (restr.)<sup>6</sup>  
 Species : *iris* (Lea)—*nasuta* (San)—*recta* (Lam.)<sup>7</sup>  
*luteola* (Lam.)—*radiata*(Gmel.)—*orbiculata* (Hildr.)<sup>8</sup>

<sup>1</sup> These three genera are practically identical with regard to their anatomy, only *Obliquaria* is distinguished by the marsupium consisting only of a few ovisacs. They may be distinguished by shell characters, which, however, are hard to define. All the species enumerated here are characterized by the absence of papillæ or flaps on the mantle edge in front of the branchial opening. A final arrangement of the genera must be left for the future.

<sup>2</sup> *Obovaria ligamentina* = *Lampsilis ligamentina*. This species undoubtedly belongs into this group, and not with the true *Lampsilis*.

<sup>3</sup> *Proptera*, as defined by Sterki. *P. alata* is distinguished by its peculiar glochidia (rectangular, with two spines). But *P. gracilis*, which agrees in all other respects, has different glochidia; they are of the normal *Lampsilis*-shape, but much smaller.

<sup>4</sup> *Car. parva* has the inner lamina of the inner gills not connected with the abdominal sac, and the supra-anal opening is entirely closed; for the rest it resembles the *iris*-type of *Lampsilis*.

<sup>5</sup> *Micromya fabalis* agrees well with the *iris*-type of *Lampsilis*, but the inner lamella of the inner gill is partly free from the abdominal sac. Both *Carunculina* and *Micromya* form a transition from the more primitive forms to the typical *Lampsilis*. Further study possibly will throw more light upon these forms.

<sup>6</sup> *Lampsilis* is characterized by the development of peculiar structures on the mantle edge. The first group has papillæ, the second a flap.

<sup>7</sup> Also *Lampsilis vibex nigrina* (Lea) from Florida and *L. anodontoides* (Lea) from Texas have been investigated, and prove to belong to this group.

<sup>8</sup> *L. orbiculata* is not at all related to *L. ligamentina*, as Simpson thinks, but it belongs to the *ventricosa* group of *Lampsilis*, for it has a well-developed flap on the mantle edge.

*cariosa*(Say)—*multiradiata*(Lea)—*ventricossa*(Barn.)  
and var. *ovata* (Say).

7. Genus: *Truncilla* Raf.<sup>1</sup>

Species: *triquetra* Raf.—*perplexa rangiana* (Lea).

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#### NOTES AND NEWS.

THE Wendell Phillips High School, Chicago, in its regular Zoology work is doing things unique with the mollusca. Each pupil is required to make a "cigar box" collection of shells. These are fixed up nicely and covered with glass. The specimens are named on inside of lid and an exhibition takes place to which parents and friends are invited. This year over 200 boxes and 8000 specimens were exhibited.

The students under the direction of Mr. E. E. Hand, the teacher are urged to make a thorough study of their own region and in cooperation with the Agassiz Association are arranging for exchanges with high schools and individual collectors all over the world. Anyone interested is invited to correspond.—E. E. HAND.

IT is with sorrow we record the death of Mr. John Ford, at his home in Philadelphia, on January 10, 1910. An obituary will appear in March number.

WE also regret to announce the death of Dr. John H. Britts of Clinton, Missouri, which occurred November 14, 1909.

*Lymnæa cubensis aspirans*, n. subsp. The shell differs from *L. cubensis* by its much longer spire of very convex whorls. Length 12, diam. 6, length of aperture 6 mm.; whorls 6. Barbadoes. Types No. 85455 A. N. S. P. This is not *Lymnæa barbadensis* Sowerby, Conch. Icon., xviii, pl. 14, f. 100. I have seen no Antillean species resembling that figure.—H. A. PILSBRY.

WE learn with regret of the death of Dr. Kakichi Mitsukuri, the eminent Japanese zoölogist, on September 16.

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<sup>1</sup>Shell characters peculiar, and also mantle edge, and in some respects also the marsupium. The two species differ considerably, and the two subgenera of Simpson (*Truncilla* and *Pilea*) should perhaps be elevated to the rank of genera.